Chosen risk factors for osteoporosis and the level of knowledge about the disease in peri- and postmenopausal women

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Abstract

Introduction: Osteoporosis as a chronic disease, affecting especially women in postmenopausal age, is an important, social and economic health problem especially of women of today's world. The aim of the study was to assess the level of knowledge of women in the peri- and postmenopausal period about the prevention of osteoporosis and show the influence of chosen risk factors on the level of this knowledge.

Material and methods: A group of 300 women aged 45-65, being patients of healthcare centres in Chełm, Lublin and Zamość (Lublin voivodeship, south-eastern Poland) were included in the study. The purposive sampling was used. Osteoporosis Knowledge Test (OKT) 2011 was the research tool. Gathered material was subjected to descriptive and statistical analysis. Tukey's test, t-student test and variance analysis (ANOVA) were all applied. An accepted p materiality level was < 0.05 and p < 0.01.

Results: Respondents presented the average level of knowledge about the role of physical activity in the prevention of osteoporosis (M = 13.93) and a low level of knowledge about well-balanced diet rich in calcium (M = 9.77). The knowledge about risk factors, screening and treatment remained on the average level (M = 8.00). An influence of socio-demographic factors on the level of knowledge was shown. Also some behaviours, associated with the lifestyle indeed influenced the level of this knowledge.

Conclusions: Professional educational programs on osteoporosis should be implemented in the population of Polish peri- and postmenopausal women.

Key words: osteoporosis, menopause, level of knowledge, prophylaxis.

Introduction

Osteoporosis is determined according to the definition of the Foundation and National Institutes of Health – NOF/NIH (2001) as an illness of the skeleton, being characterized by reduced endurance of the bones, which causes an increased risk of fractures. This disease is included among relevant health, social and economic problems of the contemporary world [1-4]. Since the frequency of falling ill is growing with age, therefore in relation to the steady increase of the average life span in the today's society, the number of fractures will be on the increase [1].

Osteoporosis affects the entire population at different life stages; however women in the postmenopausal age and the elderly appear to be most exposed to its development [1]. It is estimated that worldwide osteoporosis affects 200 m women, from whom about 20-25% will sustain an injury in the form of a bone fracture [5].

The perimenopausal period, covering a few years preceding the menopause and at least 12 months after the menopause, is unavoidably connected with reduced

biosynthesis of oestrogens, being a consequence of reducing and finally stopping the activity of Graafian follicles. The positive effect of oestrogens on the bone tissue, consisting in stimulating osteogenesis and inhibition of the bone resorption process is terminated [1, 6]. Primeval, involutional osteoporosis is characteristic of the postmenopausal period, in which the main loss of the tubercular bone layer over the compact layer, and bone mass loss is caused by exaggerated activity of osteoclasts [1, 2].

In the development of the skeleton one may observe 3 periods, being characterized by a diversified amount of bone mass: growth, maturity, and catagenesis. Bone mass loss during catagenesis can be regarded physiological and then is termed as osteopenia, or wrongly identified with osteoporosis [7].

Most important risk factors for osteoporosis are: age, female sex, ethnic group, genetic factors, inherited factors, early menopause, slim silhouette and low body mass, diseases disturbing the bone metabolism, some medicines taken for a long time, insufficient physical activity, consumption of too small amounts of calcium

and vitamin D, overconsumption of alcohol, caffeine and cigarette smoking and protein-rich diet [8].

Recent studies prove that the increased risk of low-energy bone fracture is the essence of osteoporosis. Discovering the clinical risk factors for osteoporosis fractures and developing the Frax algorithms (WHO *Fracture Risk Assessment Tool*), by Professor J. A. Kanis in 2008, which enables to calculate the 10-year probability of major osteoporotic fractures, proves a considerable progress in osteoporosis risk factors research [9].

The Frax algorithms take into account clinical risk factors for osteoporosis fractures, body mass index (BMI) and bone mineral density (BMD) *T*-score of the femoral neck. Clinical risk factors for osteoporosis fractures are as follows: age between 40 and 90 years, female gender, previous osteoporotic fracture, parent fractured hip, active tobacco smoking, excess alcohol consumption over 30 mg of alcohol per day, taking glucocorticoids for 3 months or longer at present or in the past, rheumatoid arthritis, and secondary osteoporosis [4].

The foundation of preventive actions in the aspect of osteoporosis is relevant diet throughout the entire life [10]. The appropriate amount of calcium in the diet constitutes the factor assisting in getting top bone mass in the period of growing as well as in keeping the state of the bone tissue at the appropriate level in the postmenopausal period [11]. Vitamin D is essential for supporting the normal process of absorbing calcium from intestines. It was proved that vitamin D and its active metabolites have a positive effect on the quality and density of bone mass [12, 13].

In prevention of osteoporosis, a well-comprehended physical activity, being an essential factor of the normal development of the bone tissue and keeping the bone metabolism on the desirable level plays a crucial role [14].

Both in Poland and all over the world, many patients suffering from osteoporosis fractures do not undergo further diagnostic procedures and do not receive pharmacologic treatment for osteoporosis. This is why the International Osteoporosis Foundation (IOF) launched an international campaign 'Capture the fracture'. The main aim of the campaign is to 'detect osteoporotic fractures and referring patients to out-patient clinics specializing in the diagnosis and treatment of osteoporosis. The campaign should reduce the number of osteoporotic fractures in the future [15, 16]. The aim of the present study was to determine the state of knowledge of peri- and postmenopausal women about the prevention of osteoporosis and showing predictor models affecting the level of this knowledge which can turn out to be helpful in formulating relevant preventive programs.

Material and methods

The study was conducted in the period from 2 January to 30 March 2012 on a group of 300 women at the age range of 45 to 65, being patients of healthcare centres in Chełm, Lublin and of surroundings of Zamość (Lublin voivodeship, south-eastern Poland). The purposive sampling was used.

The Osteoporosis Knowledge Test (OKT) (2011) was used to perform own examinations. The OKT is a tool consisting of 32 elements evaluating the knowledge in applying a well-balanced diet with a lot of products rich in calcium, essential for construction and keeping mass of the bone; the physical activity and risk factors, screening and treatment of osteoporosis. In order to set the operands, and hence to present characteristics of the research group, the questionnaire prepared by the author was used, containing 13 questions.

The empirical material was subjected to descriptive and statistical analysis. Tukey's test, *t*-Student test and variance analysis (ANOVA) were all applied. An accepted *p* materiality level was < 0.05 and *p* < 0.01. Computer software IBM SPSS Statistics 19 was applied.

The examined group comprised women at the age from 45 to 65. Seventy-seven percent of respondents were aged 45-55 years ($n = 321$). The remaining women were from 56 up to 65 years of age ($n = 69$; 53%). Considering the level of education it turned out that almost 40% of the examined women had secondary education ($n = 119$), 43 (14.3%) vocational education and 14% ($n = 42$) higher education.

As regards socio-economic conditions, 51.3% ($n = 154$) of the examined women described them as good, however 30.3% ($n = 91$) as average. The scanty percentage complained about bad conditions ($n = 6$, 2.0%). For a fuller picture of the examined group, respondents were asked about reporting for densitometry. As it turned out a significant number of examined women had never had bone density examined ($n = 208$; 69.3%), and 3 individuals out of examined were not sure what such an examination consists in.

Results

As regards the acquaintance of risk factors for osteoporosis amongst women in the perimenopausal period, it was shown that the majority of respondents (77.6%) agreed with the fact that a low calcium diet constitutes an essential risk factor for osteoporosis. Older age was indicated by 89.4% of the examined women, and the menopausal period in women by 85.4%. Unfortunately, only 34% and 41.7% of respondents connected dipsomania and cigarette smoking, respectively, with the possibility of falling ill with osteoporosis. Actually the comprehended physical activity and applying the diet rich in calcium constitute fundamental links with reference to the prevention of osteoporosis.

Most respondents thought that cycling was the best way of preventing osteoporosis (61.3%), swimming (43%), running (48.3%) and aerobics (65%) being next in

turn, whereas with the best source of calcium – cheese (98%), sardine (44.7%), meat of the chicken (61%), yogurt (95%) and ice-cream (48%). Majority of respondents declared that for correct absorbing of calcium, vitamin D was essential (70%), which is provided by sunlight (67%). Unfortunately, only 13% of women indicated growing up as the optimum period in life for building strong bones. The above data are presented in Table I.

Tab. I. Knowledge of respondents on osteoporosis

	Very probable	Little probable	No impact	I don't know
Eating a diet low in dairy products	77.6%	14.7%	6.7%	1%
Being menopausal; "change of life"	85.4%	5%	4.3%	5.3%
Having a parent or grandparent who has/had osteoporosis	53.3%	20%	15%	11.7%
Being a white and Asian woman	31.3%	14.3%	18.7%	35.7%
Being an elderly man	89.4%	5%	3.3%	2.3%
Having ovaries surgically removed	32.3%	15.7%	20.7%	31.3%
Taking cortisone (steroids e.g. prednisone) for a long time	29.7%	12.7%	7.3%	50.3%
Being overweight	48.7%	22.7%	19%	9.6%
Having an eating disorder	94%	1.7%	1.3%	3%
Consuming more than 2 alcoholic drinks per day	34%	24.7%	24%	17.3%
Smoking on a daily basis	41.7%	25%	17.3%	16%
To strengthen bones, it is recommended that a person exercise at a moderately intense level for 30 minutes a day at least	51% 3 days a week	10.3% 4 days a week	14.7% 5 days a week	24% I don't know
Exercise makes bones strong, but it must be hard enough to make breathing	41% Just a little faster	2.7% Much faster, but talking is possible	2.3% So fast that talking is not possible	36% I don't know
Which of the following activities is the best way to reduce a person's chance of getting osteoporosis?	43% Swimming	29% Brisk walking	9% Stretching	19% I don't know
Which of the following activities is the best way to reduce a person's chance of getting osteoporosis?	61.3% Cycling	20% Yoga	0.7% Lifting weights	18% I don't know
Which of the following activities is the best way to reduce a person's chance of getting osteoporosis?	48.3% Jogging and running	7.7% Golfing using a golf cart	22.7% Gardening	21.3% I don't know
Which of the following activities is the best way to reduce a person's chance of getting osteoporosis?	5% Bowling	4.3% Doing laundry	65% Aerobic dancing	25.7% I don't know
Which of these is the best source of calcium?	1% Apples	98% Cheeses	0% Cucumbers	1% I don't know
Which of these is the best source of calcium?	26% Peanut butter	26% Turkey meat	44.7% Canned sardines	3.3% I don't know
Which of these is the best source of calcium?	61% Chicken	26.3% Broccoli	2.4% Grapes	10.3% I don't know
Which of these is the best source of calcium?	95% Yoghurt	1% Strawberries	3% Cabbage	1% I don't know
Which of these is the best source of calcium?	48% Ice-cream	15% Grape fruit	8% Radishes	29% I don't know
Which of the following is the recommended amount of calcium intake for an adult?	16% 600-800 mg daily	39% 1000-1200 mg daily	3% 1400-1600 mg daily	42% I don't know
How much milk must an adult drink to meet the recommended amount of calcium?	53% 1 glass	26% 2 glasses	15% 3 or more glasses	6% I don't know
Which of following is the best reason for taking a calcium supplement?	3.3% If a person skips breakfast	58% If a person does not get enough calcium from diet	34.7% If a person is over 45 years old	4% I don't know

Tab. I. Cont.

	Very probable	Little probable	No impact	I don't know
Which vitamin is required for the absorption of calcium?	6% Vitamin A	8% Vitamin C	70% Vitamin D	16% I don't know
What is the best source of vitamin required for the absorption of calcium?	12% Carrot	3% Orange	67% Sunlight	18% I don't know
What is the best food source of the vitamin required for the absorption of calcium?	20% Spinach	46% Cheeses	21% Salmon	13% I don't know
Which of the following is the recommended amount of vitamin required for the absorption of calcium for an adult, 50 years old and older?	13% 800-1000 IU daily	32% 1200-1400 IU daily	7% 1600-1800 IU daily	48% I don't know
When is the best time to build strong bones?	63% Childhood	29% Adolescence	5% Young adulthood	3% I don't know
Osteoporosis can be diagnosed by	4% Blood test	88.3% DXA scan	4% Symptoms	3.7% I don't know
Once you have osteoporosis	2% There is nothing you can do about it	90% You can take medication to treat it	5.7% You must be careful when lifting objects	2.3% I don't know

Summing up, women in the peri- and postmenopausal age presented a medium level of knowledge on the role of physical activity in osteoporosis prophylaxis ($M = 13.93$) and a low level of knowledge related to problems connected with proper diet rich in calcium ($M = 9.77$). Knowledge about risk factors, screen tests and the treatment remained on a medium level ($M = 8.00$). The questioned women presented insufficient general knowledge on osteoporosis ($M = 15.71$). The data are presented in Table II.

Analysing the influence of education on the level of women's knowledge about osteoporosis it can be stated that the level of education was diversifying respondents in terms of the presented knowledge about the role of a diet rich in calcium in the aspect of preventing osteoporosis. Women with primary and vocational education had significantly smaller knowledge on this subject than women with secondary and higher education. However, important differences were not observed between women with secondary and higher education. The same applied to the influence of education as the level of knowledge about the role of physical activity, risk factors, screening and treatment and of general knowledge about osteoporosis (Fig. 1).

Examining the influence of socio-economic conditions on the level of knowledge of respondents, it was stated that individuals declaring very good socio-economic conditions had indeed presented the highest level of knowledge ($M = 8.61$) about risk factors, screening and treatment of osteoporosis as compared to individuals having average or bad socio-economic conditions. However, differences close to the statistical significance occurred for knowledge about nutrition (biggest in individuals with good socio-economic conditions [$M = 14.31$], and smallest in individuals with average or bad socio-economic conditions [$M = 13.34$]) and knowledge about the role of physical activity (biggest amongst individuals with very good socio-economic conditions [$M = 10.49$], and smallest in individuals with average or bad socio-economic conditions [$M = 9.37$]). The above relations are described in Table III.

Analysing the influence of age on the level of knowledge about osteoporosis, one should notice that younger women aged 45 to 55 years old had a significantly higher level of knowledge about the role of physical activity ($M = 10.03$) than older women (56-65 years old) ($M = 8.91$). Younger women also had the highest level of knowledge indeed about risk factors, screening and treatment ($M = 8.26$) than older women ($M = 7.12$). The above relations are described in Table IV.

Physical activity is a boost of bone tissue to develop top bone mass in the young age whereas in the elderly it hinders the disintegration of this bone tissue. It is also proved that long-term immobilizing, or neglecting

Tab. II. Knowledge on osteoporosis: summing up

Test of knowledge on osteoporosis	N	Min	Max	M	SD
Knowledge about the role of physical activity	300	4	23	13.93	3.36
Knowledge about nutrition – calcium consumption	300	0	17	9.77	2.90
Knowledge about risk factors, screen tests and treatment	300	0	14	8.00	2.45
General knowledge about osteoporosis	300	4	25	15.71	3.83

the role of everyday physical exercises (walking, gymnastics, running or walking up the stairs) for the structure and development of the skeleton, causes a fall in bone mass [14]. Examining the influence of physical activity on the level of knowledge about osteoporosis it was pointed out that women who are active in terms of physicality were characterized indeed by a high level of knowledge about the role of feeding, physical activity, risk factors and generally osteoporosis than women not practising sport (Fig. 2).

Diagnosing the osteoporosis is based, among others, on the lower bone mineral density (BMD) (in g/cm^2). Bone mineral density is an indicator of resistance of the bone structure, that is, it is responsible for 70% of its endurance [17]. Our own studies show that the above examination had no impact on the level of knowledge on the prevention of osteoporosis. Women examined were characterized by the highest level of knowledge about correct nutrition and with the highest level of general knowledge about osteoporosis than women who they did not have their bone mineral density determined. Additionally respondents, at whom such an
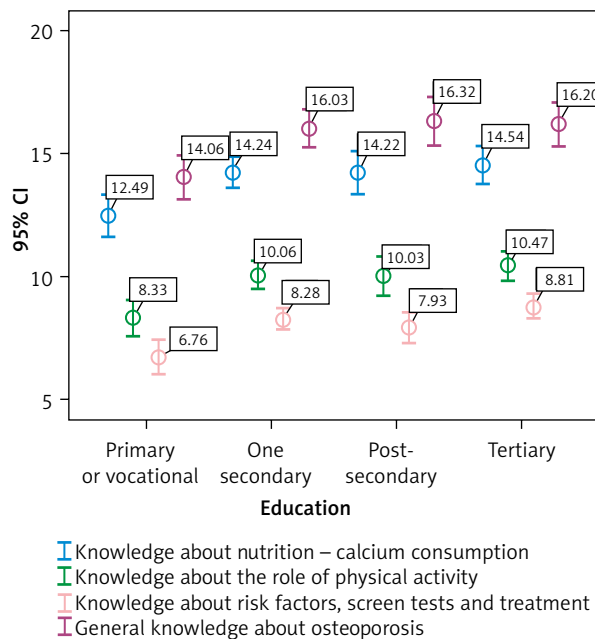

Fig. 1. The influence of education on the level of knowledge about osteoporosis

Tab. III. Impact of socio-economic conditions on the level of knowledge about osteoporosis

Level of knowledge	Socio-economic conditions	Anova					Tukey's test
		N	M	SD	F	p	
On nutrition (calcium consumption)	Very good (1)	49	13.90	3.42	2.51	0.083	
	Good (2)	154	14.31	3.37			
	Average or bad (3)	97	13.34	3.27			
On the role of physical activity	Very good (1)	49	10.49	2.57	2.45	0.083	
	Good (2)	154	9.80	2.95			
	Average or bad (3)	97	9.37	2.93			
On risk factors, screen tests and treatment	Very good (1)	49	8.61	2.29	3.42	0.034*	1-3 p = 0.033*
	Good (2)	154	8.09	2.42			
	Average or bad (3)	97	7.54	2.53			
General knowledge about osteoporosis	Very good (1)	49	15.78	3.73	1.46	0.235	
	Good (2)	154	16.02	3.92			
	Average or bad (3)	97	15.18	3.73			

Tab. IV. Influence of the age on the level of knowledge about osteoporosis

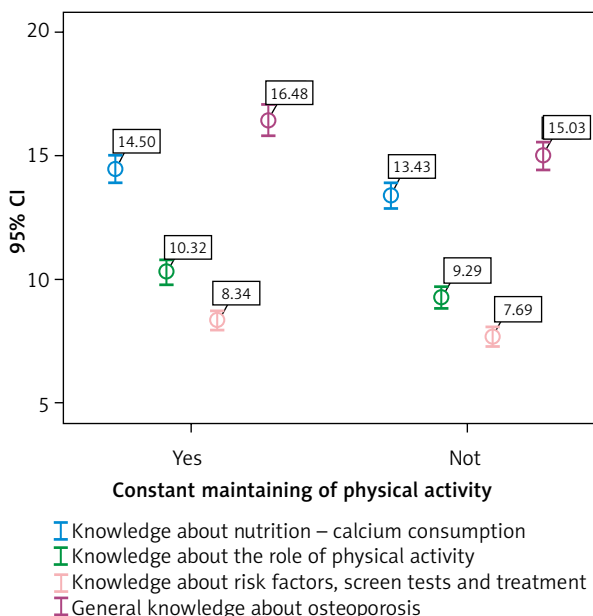| Level of knowledge	Age				t-Student test	
	45-55		56-65			
	M	SD	M	SD	t	p
On nutrition (calcium consumption)	14.08	3.43	13.43	3.10	1.40	0.164
On the role of physical activity	10.03	2.83	8.91	2.99	2.84	0.005**
On risk factors, screen tests and treatment	8.26	2.42	7.12	2.39	3.46	0.001**
General knowledge about osteoporosis	15.85	3.89	15.23	3.63	1.17	0.242

Fig. 2. The impact of good physical condition on the level of knowledge about osteoporosis

examination was performed had a significantly bigger knowledge about the role of physical activity and about risk factors for screening and treatment (Table V).

Cigarette smoking hinders action of osteoblasts and disturbs processes of absorbing calcium. A connection exists between cigarette smoking and the increase in frequency of osteoporotic fractures [12]. Based on our own examinations, it may be stated that the fact of cigarette smoking was diversifying examined women

in terms of the level of knowledge about osteoporosis. As it turned out higher knowledge about risk factors, screening and treatment was presented by smoking individuals (M = 8.49) than non-smoking individuals (M = 7.81). Results are presented in Table VI.

Discussion

Osteoporosis is one of main medical and social problems and along with a longer average life span in the developed countries, more cases of osteoporosis can be expected in the near future and in consequence more osteoporotic fractures [18]. Especially women in the postmenopausal age are predisposed to low-energy fractures, therefore it is predicted that almost half of women, aged over 50, will be affected by the fracture [19].

Our own examinations showed that the level of knowledge of the majority of women about principles of correct nutrition was insufficient and such knowledge remained in the close relationship with the education and socio-economic status. Straight majority of women having secondary and higher education and enjoying better socio-economic conditions had the highest level of knowledge about a calcium-rich diet. Results of the majority of research confirm these correlations with osteoporosis. Turkish studies by Gemalaza *et al.* are an example [20] of noticing a relation of the knowledge in this respect.

Also studies conducted in Vietnam by Nguyen *et al.* [21] and by Costa-Paiva *et al.* [22] in Sao Paulo in Brazil

Tab. V. Densitometry and knowledge of osteoporosis

Level of knowledge	Densitometry done to exclude the risk of osteoporosis				*t*-Student test	
	Yes		No			
	M	*SD*	*M*	*SD*	*t*	*p*
On nutrition (calcium consumption)	15.05	2.87	13.46	3.42	3.80	0.000**
On the role of physical activity	10.29	2.58	9.54	3.00	2.03	0.043*
On risk factors, screen tests and treatment	8.49	2.10	7.77	2.54	2.31	0.022*
General knowledge about osteoporosis	16.85	3.36	15.23	3.91	3.37	0.001**

Tab. VI. Cigarette smoking and the level of knowledge on osteoporosis

Level of knowledge	Cigarette smoking				*t*-Student test	
	Yes		No			
	M	*SD*	*M*	*SD*	*t*	*p*
On nutrition (calcium consumption)	14.40	3.45	13.75	3.32	1.49	0.137
On the role of physical activity	10.30	3.06	9.57	2.82	1.96	0.051
On risk factors, screen tests and treatment	8.49	2.38	7.81	2.46	2.18	0.030*
General knowledge about osteoporosis	16.20	4.00	15.52	3.76	1.39	0.164

demonstrated an identical relation. In both cases the level of knowledge was determined as low. Women in the perimenopausal age should care for the appropriate supply of calcium of even up to 1500 mg a day. However, scarcely 13% of respondents pointed correctly at this dose for the adult man, 48% of women concluded about the recommended dose of calcium with a reply "I don't know". Filip [23] pays attention to insufficient supplementing of calcium amongst women in the postmenopausal age, applied mainly by order of the doctor. Also Kasper *et al*. [24] prove a little interest of women in supplementing calcium (6.7% of respondents).

Properly comprehended, everyday physical activity has a beneficial effect on the structure and keeping bone mass in every age. Our own examinations showed that women had an average but insufficient level of knowledge about the role of regular physical exercise, which largely depended on the level of education and socio-economic conditions. Pilewska *et al*. [25], examining the influence of the physical activity on osteoporosis, presented data saying that only 17.3% of women aged 45-60 confirmed performing regular physical exercises for 1-2 hours every week.

Also Szczygielska-Majewska *et al*. [26], after conducting their examinations concerning a lifestyle in the aspect of the prevention of osteoporosis, demonstrated that as many as 65.8% of individuals examined by them did not carry out any form of physical exercise. Hernandez-Rauda *et al*. [27] confirmed this fact by carrying out research in San Salvador, on the basis of which it was stated that a little percentage of women of different ages only practised any form of physical exercise.

In our own examinations, a level of knowledge of perimenopausal women about risk factors, screening and treatment of osteoporosis was determined as average but insufficient and to a considerable degree depending on the education and socio-economic status. In spite of the fact that majority of respondents (77.6%) agreed with the fact that the diet of low calcium content constitutes an essential risk factor for osteoporosis, only 34% and 41.7% of respondents connected alcohol abuse and cigarette smoking, respectively, with the possibility of falling ill with osteoporosis. Indian examinations (Sapna *et al*. [28]) confirm that only less than a half of the examined women regarded early menopause, alcohol abuse and wrong diet as risk factors for osteoporosis.

Also Spencer [29] examining the Scottish population demonstrated a considerable deficiency of the knowledge on risk factors. The largest group of the examined people (31.8%) had no knowledge on the above subject, whereas 19.3% of respondents did not know how to prevent osteoporosis. Examinations conducted in the George University Freemason (Washington, D.C.), including a group of women aged 22-84, demonstrated an insufficient level of knowledge on risk factors and prevention of osteoporosis [30].

Conclusions

1. Peri- and postmenopausal women presented an average level of knowledge about the role of physical activity in osteoporosis prevention and a low level of knowledge with reference to issues associated with a well-balanced diet rich in calcium.
2. The respondents had an average, but insufficient, knowledge on risk factors, screening and treatment and general knowledge of osteoporosis.
3. Socio-demographic factors as well as some forms of behaviour, associated with a lifestyle, such as regular physical activity, prophylactic examinations and cigarette smoking indeed influenced the level of knowledge possessed.

Disclosure

Authors report no conflict of interest.

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